

REMARKS

Claims 1-14 have been canceled from this application without prejudice or disclaimer, and with the understanding that the subject matter encompassed by these claims may be pursued in a divisional application.

Claims 15-27 have been amended.

The amendments to claims 15 and 18 reformat the claims, clarify the components of the recited heat-resistant fiber impregnated material through "comprising" language and restrict the recited polyimide binder resin to consisting essentially of a tetracarboxylic acid component and an aromatic diamine component.

The amendments to claims 16, 17, 19, 20 and 24-27 more clearly reflect proper antecedent basis.

The amendments to claims 21 and 22 replace the phrase "impregnated sheet-like material" with the synonymous term "prepreg." Support for this amendment can be found, for example, in the specification at page 12, lines 24-25.

The amendment to claim 23 reformats the claim, replaces the phrase "impregnated sheet-like material" with "prepreg," clarifies the components of the recited heat-resistant fiber impregnated material through "comprising" language, and restricts the recited polyimide binder resin to consisting essentially of a tetracarboxylic acid component and an aromatic component.

No new matter has been introduced by any of the aforementioned amendments. After entry of the amendments, claims 15-27 will be pending.

I. Rejection Under 35 U.S.C. § 112, second paragraph

Claims 21-24 and 26 are rejected under 35 U.S.C. § 112, second paragraph because the Examiner states that (a) there is insufficient antecedent basis for the recitation of "an impregnated sheet-like material" in the preamble of claims 21-22; and (b) the phrase "sheet-like" renders claims 21-24 and 26 indefinite. The Examiner suggests amending the preamble clause language to make it consistent among claims 15-22.

Applicants have amended claims 21-23 to recite "a prepreg," thus removing the "sheet-like" language objected to by the Examiner and also distinguishing the prepreg material of claims 21-23 from the heat-resistant fiber impregnated material of the earlier claims. As

discussed above, support for this amendment may be found, for example, in Applicants' specification at page 12, lines 24-25. As such, Applicants believe that the two grounds for the Examiner's rejection (*i.e.*, insufficient antecedent basis and indefiniteness due to the use of the phrase "sheet-like") have been fully addressed. Applicants therefore request that this rejection be withdrawn and that claims 21-24 and 26 be found to be in condition for allowance.

II. Rejection Under 35 U.S.C. § 102(b) / § 103(a)

Claims 15-17, 23 and 26 are rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,260,412 to Yamamoto *et al.* ("*Yamamoto*"). According to the Examiner, *Yamamoto* is directed toward a terminal-modified imide oligomer composition that can be impregnated with reinforcing fibers. The Examiner states that the *Yamamoto* composition has a glass transition temperature of 250°C or more, can comprise a 2,3,3',4'-biphenyltetracarboxylic acid and can be adhered to a metallic foil. The Examiner acknowledges that *Yamamoto* does not explicitly teach the recited tensile strength or thermal decomposition/elongation properties in Applicants' claims 15 and 23 respectively, but contends that these properties would be inherent in the *Yamamoto* compositions.

Applicants respectfully disagree with the Examiner's characterization of the *Yamamoto* terminal-modified imide oligomer compositions as inherently possessing the same properties as the claimed polyimides of Applicants' invention. The oligomer compositions described in *Yamamoto* are obtained by heat curing a combination of a terminal-modified imide oligomer (A) with an unsaturated imide compound (B).

The terminal-modified imide oligomer (A) is described as being formed by reaction of three components: a biphenyltetracarboxylic acid component, an aromatic diamine component and a monoamine component having a carbon-carbon triple bond (see col. 3 of *Yamamoto*, lines 4-9). As such, the terminal-modified oligomer (A) contains a polymerizable triple bond moiety at its terminus and at least one imide bond within the main chain (see col. 3, lines 14-21).

The unsaturated imide compound (B) is described as being formed by reaction of a substituent-containing nadic anhydride with a monoamine having a carbon-carbon triple bond (see col. 5, lines 30-35). As such, the unsaturated imide compound (B) also contains, similar to

the terminal-modified oligomer (A), a polymerizable triple bond moiety at its terminus and at least one imide bond within the compound (see col. 5, lines 36-40).

The carbon-carbon triple bonds present at the termini of the imide oligomer (A) and the unsaturated imide (B) form a cross-linking aromatic ring during heat curing through a trimerization reaction and the nadic imide groups on (B) also crosslink. Thus, the oligomer compositions described in *Yamamoto* are highly crosslinked. Such crosslinked oligomers do exhibit high heat resistance but are rigid and non-thermoplastic.

In contrast, the polyimides claimed by Applicants do not have cross-linked structures and are thermoplastic. Claims 15 and 23, as amended, restrict the components of the recited polyimide to a tetracarboxylic acid component and an aromatic diamine component. Unlike the (A) and (B) components of the oligomers described by *Yamamoto*, these components do not contain the modified termini such as carbon-carbon triple bonds or nadic imides group within the chain that allow cross-linking to occur. The non-cross-linked polyimides claimed by Applicants are therefore structurally distinguishable from the cross-linked oligomers described by *Yamamoto* and would have different physicochemical properties such as, for example, tensile strength and breaking elongation. Further, there is no teaching or suggestion in *Yamamoto* of non-cross-linked oligomer compositions. At least for these reasons, Applicants respectfully request that the ground for this rejection be withdrawn and that claims 15-17, 23 and 26 be found to be in condition for allowance.

III. Rejection Under 35 U.S.C. § 103(a)

Claims 18-22, 24, 25 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Yamamoto* in view of U.S. Published Application No. 2002/0106521 to Hashimoto *et al.* ("*Hashimoto*"). According to the Examiner, *Yamamoto* fails to teach that the described terminal-modified imide composition solution impregnated into the reinforcing fiber comprises 1,2-dimethylimidazole and/or 1-methyl-2-ethylimidazole. Further, the Examiner states that while *Yamamoto* teaches that the terminal-modified imide oligomer composition can be adhered to a metallic foil, it fails to teach that the metallic foil can be copper. The Examiner argues that *Hashimoto* teaches that the described resin composition may contain a reaction promoter for use during drying or heat curing that includes 1,2-dimethylimidazole or 1-methyl-2-ethylimidazole.

In addition, the Examiner argues that *Hashimoto* teaches that a copper film can be applied to the described resin's surface. It is the Examiner's contention that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use these particular reaction promoters in the terminal-modified imide composition solution described in *Yamamoto*. The Examiner provides an analogous statement regarding the obviousness of using the copper foil described in *Hashimoto* as the metallic foil described in *Yamamoto*.

As discussed in section II above, *Yamamoto* does not teach or suggest Applicants' claimed polyimides. *Hashimoto* cannot correct these deficiencies. Therefore, the combination of *Yamamoto* with *Hashimoto* does not render Applicants' claims obvious.

In addition, *Hashimoto* teaches the use of 1,2-dimethylimidazole or 1-methyl-2-ethylimidazoles as "promoting a reaction during drying or curing under heat" (page 7, paragraph [0062]). In contrast, these compounds are used by Applicants to make the described polyimide precursor water-soluble. Thus, a person of ordinary skill in the art would not be motivated, after a reading of *Hashimoto*, to use either of these two curing promoters as agents for inducing water-solubility in a polyimide precursor. For at least these reasons, Applicants respectfully request that the ground for this rejection be withdrawn and that claims 18-22, 24-25 and 27 be found to be in condition for allowance.

IV. Conclusion

Upon consideration of the foregoing, it will be recognized that Applicants have fully and appropriately responded to all of the Examiner's rejections. Accordingly, all claims are believed to be in proper form in all respects and a favorable action on the merits is respectfully requested. Should the Examiner feel that there are any issues outstanding after consideration of this amendment, the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution.

EXCEPT for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or to credit any overpayment to Deposit Account 50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. § 1.136(a)(3).

Respectfully submitted,

MORGAN, LEWIS & BOCKIUS LLP

By: Gregory T. Lowen
Gregory T. Lowen, Ph.D.
Reg. No. 46,882
Direct: 202-739-5915

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CUSTOMER NO. 009629
MORGAN, LEWIS & BOCKIUS LLP
1111 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Tel: 202-739-3000
Fax: 202-739-3001